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WITNESS my hand this
Eighteenth day of August 2003

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CLAMPING ASSEMBLY

FIELD OF INVENTION

The present invention relates to adjustable clamps.

BACKGROUND OF INVENTION

An adjustable clamp is a tool which is used, for example, to draw two surfaces together in a clamping action. Also, adjustable clamps can be used to hold surfaces away from each other.

A particular problem is encountered when trying to clamp together two flat surfaces, end to end.

The problem can be appreciated from Figure 1 where objects A and B are to be clamped together end to end. (The gap between objects A and B is exaggerated in Figure 1 for clarity, but the intention is for the two objects to be clamped against each other end to end).

It would be impractical to use a standard clamp, of the type which seeks to compress items positioned between its jaws. For instance in Figure 1, it would be impractical to position a standard clamp around the end points A' and B', since, in practice, objects A and B are likely to be very long. Moreover, if a standard clamp were to be placed over the end points A' B', a likely result when the clamping portions are brought together is that objects A and B may be forced out of linear alignment.

A known approach of clamping thin objects together end to end involves creating cut-out portions in the objects, and using clamps to pull the cut-out portions together. An example of a known cut-out arrangement is shown in Figure 2A (although the clamp 10 shown in Figure 2A is not known in the prior art, and is an exemplary embodiment of the present invention).

In Figure 2A, the cut-out arrangement includes cut-away portions A" B" made in objects A and B respectively. In addition, a further cut-out portion C" joins the two cut-away portions A", B", so that a clamp mechanism can be inserted into the combined cut-away portion A", B", C".

The problem remains, however, that it is very difficult to manipulate known clamps in cut-away portions such as the one designated as A", B", C" in Figure 2.

A reason for the difficulty is that, in use, this form of clamping needs to be implemented sometimes on the undersurfaces of benches or tables, which exacerbates the problem of the user having to manipulate the clamp in such a confined area.

Prior art clamps have typically been manipulated using spanners or by turning a small lever arm, which requires the spanner or lever arm to be swept through an arc. In Figure 2A, when a known clamp resides in the cut-out portion A", B", C", it would be difficult to sweep the spanner or lever arm through the arc, because the walls and surface of the objects A, B tend to obstruct the sweep of the arc. At best, it is necessary to manipulate the spanner in very small increments, because the walls of the cut-out portion A", B", C" limit the sweep of the arc.

Hence, it is difficult to use a spanner to rotate the appropriate part of a prior art clamp, because the surfaces of the objects A, B hinder access of the spanner to the known clamp residing in the cut-out portion A", B", C".

The problem is made is made more difficult when having to use a spanner to manipulate the clamps in locations such as the undersurfaces of tabletops and benches.

An object of the present invention is to overcome or at least ameliorate one or more of the problems in the above prior art, or to provide an improved alternative.

SUMMARY OF INVENTION

According to a first aspect of the present invention, there is provided an adjustable clamp assembly, including:

first and second clamp members adapted to co-operatively bring together a first and second surface,

the first clamp member having an inner surface adapted to abut against the first surface,

the second clamp member also having an inner surface adapted to abut against the second surface, both said inner surfaces generally adapted to face each other;

an elongated connection member having at least one threaded portion;

the first clamp member being rotatably connectable proximate an end of the connection member;

the second clamp member being connectable proximate the other end of the elongated connection member by screw-thread engagement with said at least one threaded portion of the connection member such that rotation of the elongated connection member causes the inner surfaces of the first and second clamp members to be drawn closer or further apart depending on the direction of the rotation,

wherein the assembly is provided with a worm-gear means adapted to provide the rotation of the elongated connection member.

According to another aspect of the invention, there is provided an adjustable clamp assembly, including:

first and second clamp members adapted to co-operatively push apart a first and second surface,

the first clamp member having an outer surface adapted to abut against the first surface,

the second clamp member also having an outer surface adapted to abut against the second surface, both said outer surfaces generally adapted to face in opposite directions;

an elongated connection member having at least one threaded portion;

the first clamp member being rotatably connectable proximate an end of the connection member;

the second clamp member being connectable proximate the other end of the elongated connection member by screw-thread engagement with said at least one threaded portion of the connection member such that rotation of the elongated connection member causes the inner surfaces of the first and second clamp members to be drawn closer or further apart depending on the direction of the rotation,

wherein the assembly is provided with a worm-gear means adapted to provide the rotation of the elongated connection member.

Preferably, the worm-gear means is provided with a connection means which allows a rotation mechanism to connect to the worm-gear for automatic mechanised rotation thereof.

Preferably, the first and second clamp members each have a height dimension, and the worm gear means has a height dimension that is substantially the same as, or is less than, the height dimensions of the clamp members, in order that, in use, the worm gear means will not protrude or will not protrude substantially above a surface of objects being clamped by the clamping assembly.

DRAWINGS

In order that the invention might be more fully understood, embodiments of the invention will be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a side view of two flat objects which are to be clamped together end to end, the gap between the two objects being exaggerated in the drawing for the sake of clarity;

Figure 2A is a plan view of an embodiment of a clamp of the present invention positioned in a known cut-away arrangement, the clamp being adapted to draw the objects A and B together;

Figure 2B is the same adjustable clamp of Figure 2A shown in isolation; and

Figure 3 is a cross-sectional side view of the clamp of Figure 2B.

EMBODIMENTS OF THE INVENTION

Referring to the drawings, Figure 1 illustrates a side view of two elongated flat objections A, B which are to be joined end to end as shown in the diagram. (The gap D between the objects is exaggerated in the diagram for clarity, but it is intended to clamp the objects end to end).

Figure 2A shows a plan view of a portion of the two objects A, B to be clamped together end to end.

Within the objects A, B, had been created cut-away portions A", B" and C".

Within these cut-away portions, an embodiment of an adjustable clamp assembly 10 is positioned.

The clamp assembly 10 is described with reference to Figure 2B, shown in isolation from the objects A, B, so that the details of the clamping assembly can be understood readily.

The clamp 10 includes first and second clamp members in the form of a first clamp component 20 and a second clamp component 30.

As seen in Figure 2A, the clamp components 20, 30 are adapted to co-operatively bring together a first E" and second E" surface of the cut-out portions A", B". Effectively, when the clamp 10 draws the two surfaces E" together, this draws together the two main flat objects A, B.

In Figure 2B, the two clamping components 20, 30 have inner surfaces 21, 31 that are adapted to abut against the surfaces E".

In Figure 2B, the first clamp component has an inner surface 21, while the second clamp component 30 has an inner surface 31.

As seen in Figure 2B, both the inner surfaces 21, 31 of the first and second clamp members 20, 30 generally face each other.

The clamp components 20, 30 are able to be joined together, as shown in Figure 2B, by an elongated connection member in the form of rod 40.

The rod 40 is an elongated cylindrical member, which has a threaded portion 41 at one end.

The first clamp component 20 is rotatably connectable proximate an end of the rod 40. The rotatable connection allows the rod 40 to rotate in a hole (not shown) located in a side of the first clamping component 20.

The second clamp component 30 is able to be connected to the other end of the rod 40 by the screw-thread 41. This means that the second component 30 is not fixed to a particular location on the end of the rod, but rather is able to be positioned at any portion along the length of the screw-threaded portion 41.

Accordingly, rotation of the rod 40, causes the inner surfaces 21, 31 of the clamp components 20, 30 to be either drawn together or further apart, depending on the direction of the rotation of the rod.

In order to facilitate rotation of the rod 40, the adjustable clamp 10 is provided with a worm-gear means in the form of worm-drive assembly 50. The worm-drive assembly includes a worm-gear 51, which co-operates with another gear 52 which is located on the body of the rod 40. In Figure 2B, the gear 52 is a spur gear, although in other embodiments the gear 52 can be a helical gear, for example.

The worm-drive mechanism is able to provide rotation of the rod 40. Known modifications and variations in worm-gear technology can be incorporated in the worm-gear means.

The worm-gear drive mechanism 50 is provided with a connection means that enables a rotation mechanism, in the form of an electric drill, to be connected to the worm gear.

In this embodiment in Figure 3, the connection means is in the form of a hexagonal nut 54 which enables a correspondingly-shaped drill bit to fit over the nut 54, so that the drill bit provides automatic rotation of the worm gear 51. Thus, the rotation of the rod 40 can be activated by an automatic mechanised rotation drive.

The use of a worm gear enables a user to operate the clamp by conveniently rotating the worm gear. For instance, in a non-automatic embodiment of the invention, the end of the worm gear is provided with a screw driver-receiving slit 53, which enables the user to rotate the worm drive 51 by inserting a screw driver.

The user is thus able to rotate the rod 40 by rotating the worm gear, which does not require a spanner to sweep through an arc. Thus, when the clamp 10 is used, for instance, in the cut-out portion A", B", C" (in Figure 2A), the clamp can be manipulated without the problem of the walls of the cut-out portion obstructing the manipulation of the clamp 10.

This advantage is present in both the manual and automatic embodiments described above, i.e. the manually adjusted worm gear or the mechanically rotated worm gear. The user is able to more conveniently rotate the worm gear of the present embodiments, compared to a situation where the user has to use a spanner to directly rotate the rod 40 that has to sweep through an arc.

For example, in Figure 3, the side view of the clamp assembly is shown located in the cut-away portion of the objects A, B. (The surfaces A'", B'" of the objects A and B are shown in dotted lines). One can imagine that if the rod 40 had to be rotated with a spanner that has to sweep through an arc, for instance, the walls of the cut-away portion would make it difficult for the spanner to sweep through its entire arc. The limitation of the arc of rotation of the spanner would be limited by a surface which, in Figure 3, is represented with a dotted line A'", B'".

In contrast, the present embodiment does not have this limitation, because the user is able to rotate the rod 40 by rotating the worm gear 51 which is readily accessible. Particularly, when the surface A''', B''' faces downwards, the convenience of the present embodiment is more readily appreciated. This could occur for instance when the surfaces A''', B''' are on an undersurface of a table.

As seen in Figure 3, the height dimension 55 of the body of the worm-drive mechanism preferably is substantially the same as, or is less than, the height dimensions 23, 33 of the clamp components 20, 30. This is to ensure that, in use, the worm-drive mechanism will not protrude or will not protrude substantially, above the surface A''', B''' of the objects A, B, being clamped together by the clamping assembly 10.

In another embodiment of the invention, the mechanism of Figure 2B is modified in the sense that, rather than drawing two surfaces together, the components are shaped so that the clamping assembly pushes two surfaces apart. For example, this can be achieved by altering the shape of the clamping components (20, 30) so that the ends of the clamping components curve inwardly towards the centre of the clamp, rather than outwardly as in Figure 2B.

In other modifications, the shape and dimensions of the components can be varied, while maintaining the function of the adjustable clamp assembly.

For instance, the length and shape of curvature of the clamping components 20, 30 can be modified. The length and thickness of the rod 40 can be modified. The location of the worm-drive can be positioned at different positions along the length of the rod.

Other types of connection means can be used, in addition to the screw-driver slit 53 or the nut-head 54.

In the embodiment, the connection mechanism embodied as item 54, can be removed from the clamp 10 after the tightening process has been completed. This ensures that, thereafter, the clamp assembly 10, or a substantial portion of it, resides below the surface A''', B''' of the objects being clamped.

The embodiments have been advanced by way of example only, and modifications are possible within the scope of the invention as defined by the appended claims.

Discussion or mention of any piece of prior art in this specification is not to be taken as an admission that the prior art is part of the common general knowledge of the skilled addressee of the specification.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An adjustable clamp assembly, including:

first and second clamp members adapted to co-operatively bring together a first and second surface,

the first clamp member having an inner surface adapted to abut against the first surface,

the second clamp member also having an inner surface adapted to abut against the second surface, both said inner surfaces generally adapted to face each other;

an elongated connection member having at least one threaded portion;

the first clamp member being rotatably connectable proximate an end of the connection member;

the second clamp member being connectable proximate the other end of the elongated connection member by screw-thread engagement with said at least one threaded portion of the connection member such that rotation of the elongated connection member causes the inner surfaces of the first and second clamp members to be drawn closer or further apart depending on the direction of the rotation,

wherein the assembly is provided with a worm-gear means adapted to provide the rotation of the elongated connection member.

2. An adjustable clamp assembly, including:

first and second clamp members adapted to co-operatively push apart a first and second surface,

the first clamp member having an outer surface adapted to abut against the first surface,

the second clamp member also having an outer surface adapted to abut against the second surface, both said outer surfaces generally adapted to face in opposite directions;

an elongated connection member having at least one threaded portion;

the first clamp member being rotatably connectable proximate an end of the connection member;

the second clamp member being connectable proximate the other end of the elongated connection member by screw-thread engagement with said at least one threaded portion of the connection member such that rotation of the elongated connection member causes the inner surfaces of the first and second clamp members to be drawn closer or further apart depending on the direction of the rotation,

wherein the assembly is provided with a worm-gear means adapted to provide the rotation of the elongated connection member.

3. A clamp assembly of claim 1 or 2 wherein the worm-gear means is provided with a connection means which allows a rotation mechanism to connect to the worm-gear for automatic mechanised rotation thereof.

4. A clamp assembly of claim 3 wherein the first and second clamp members each have a height dimension, and the worm gear means has a height dimension that is substantially the same as, or is less than, the height dimensions of the clamp members, in order that, in use, the worm gear means will not protrude or will not protrude substantially above a surface of objects being clamped by the clamping assembly.

5. An adjustable clamp substantially as hereinbefore described and illustrated with reference to the accompanying drawings excluding Figure 1.

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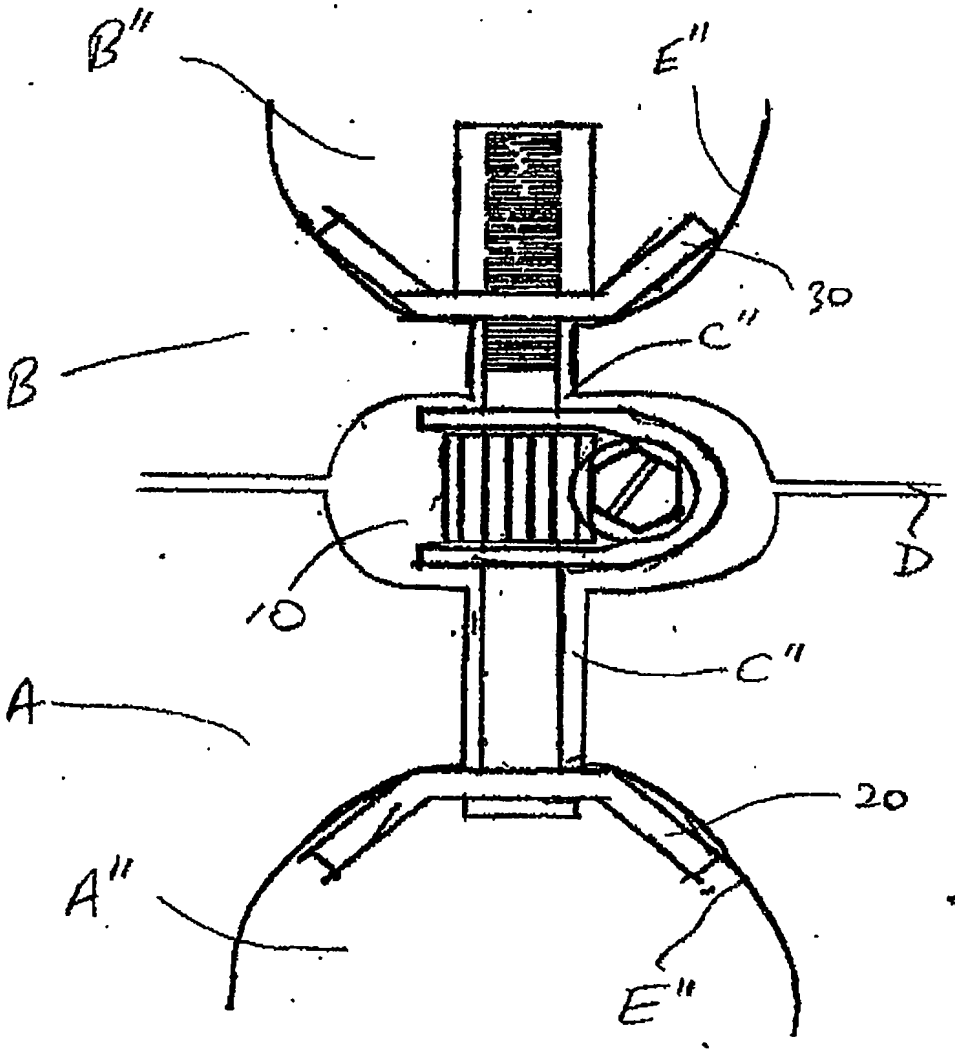

Figure 2A

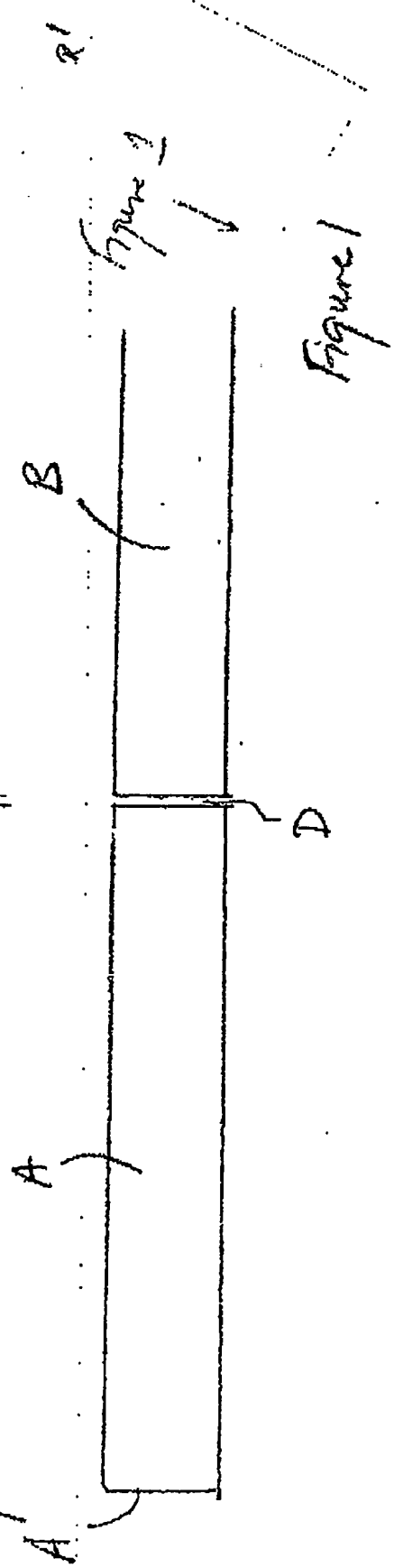

Figure 1

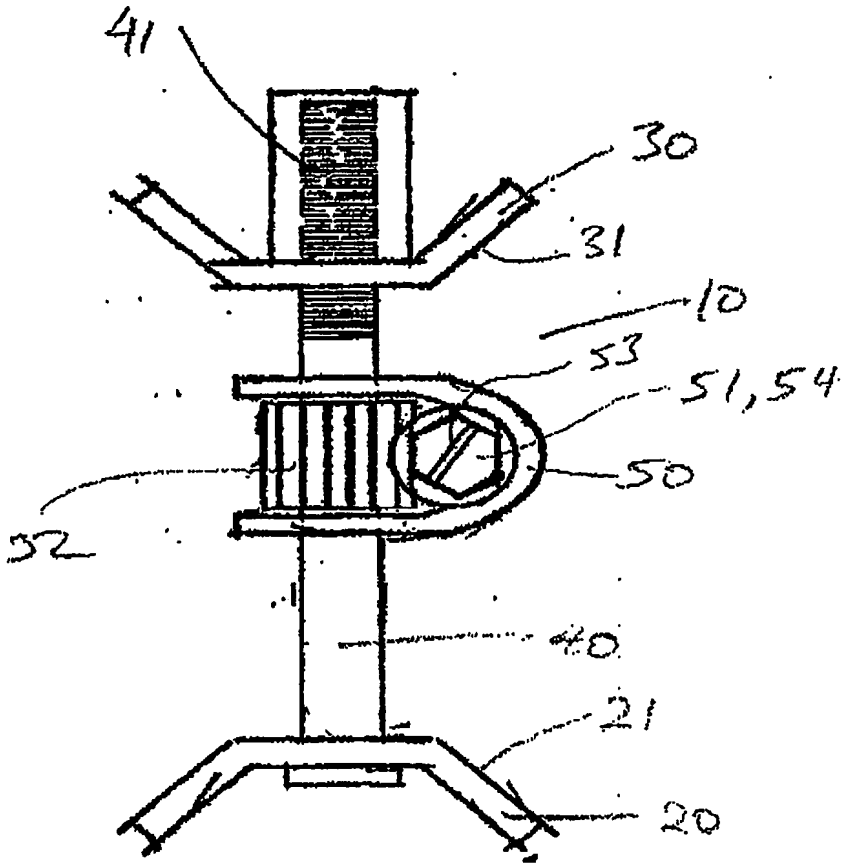

Figure 2B

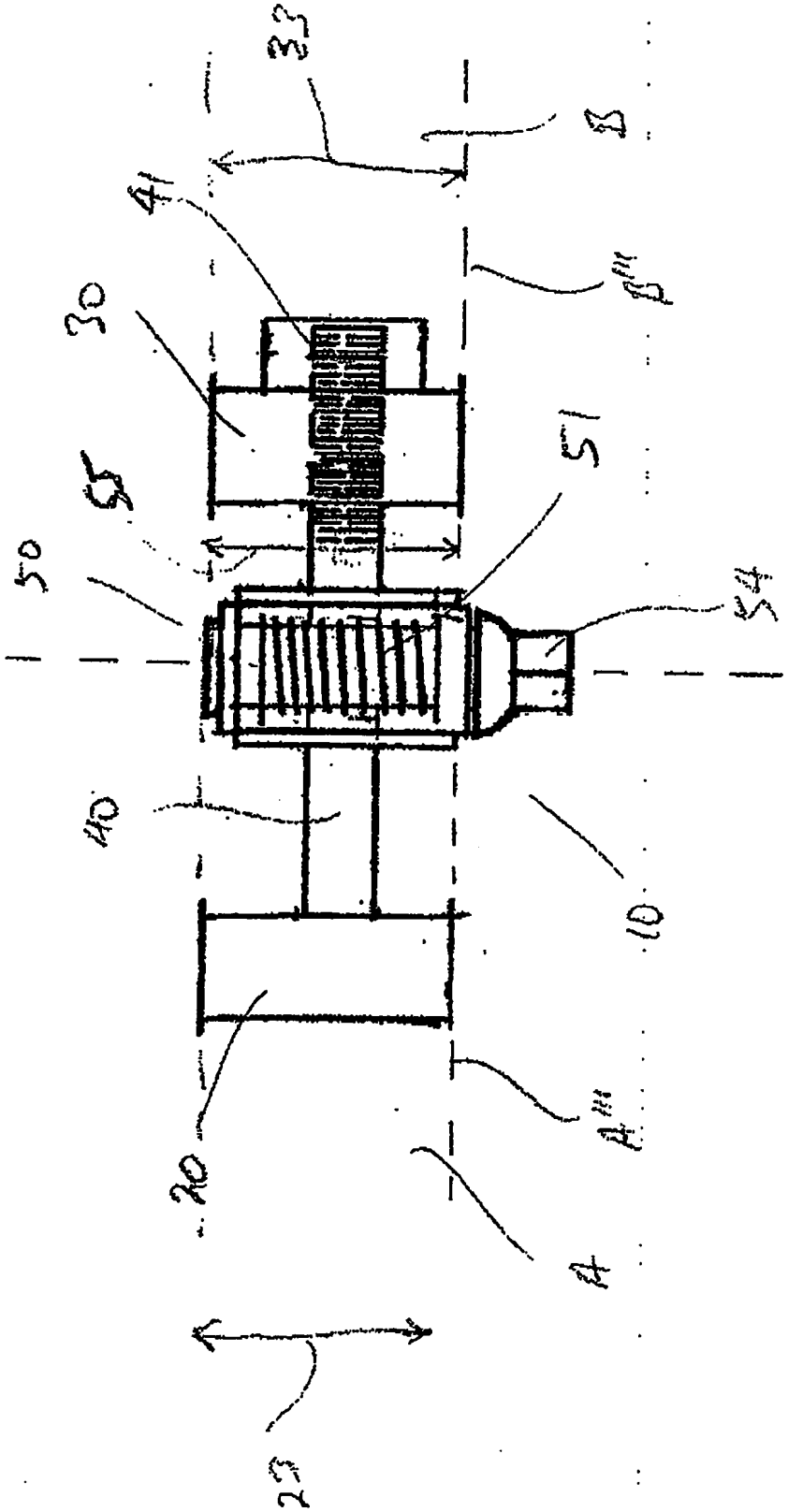

Figure 3